



PROJECT IDENTIFICATION FORM (PIF)

PROJECT TYPE: MEDIUM-SIZED PROJECT

TYPE OF TRUST FUND: GEF TRUST FUND

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PART I: PROJECT INFORMATION

Project Title:	Increasing access to clean and affordable decentralized energy services in selected vulnerable areas of Malawi		
Country(ies):	Malawi	GEF Project ID: ¹	5587
GEF Agency(ies):	UNDP	GEF Agency Project ID:	5270
Other Executing Partner(s):	Ministry of Energy - Department of Energy Affairs (DoE), Mulanje Electricity Generation Agency (MEGA), Malawi Energy Regulatory Authority (MERA), Ministry of Environment and Climate Change Management, , Selected District Councils (Mulanje, Karonga and/or Chitipa), Practical Action (NGO)	Submission Date: Re-submission Date: Re-submission Date	9 September 2013 8 October 2013 9 October 2013
GEF Focal Area (s):	CC Mitigation	Project Duration (Months)	48
Name of parent program (if applicable): • For SFM/REDD+ <input type="checkbox"/> • For SGP <input type="checkbox"/>	N/A	Agency Fee (\$):	163,875

A. INDICATIVE FOCAL AREA STRATEGY FRAMEWORK²:

Focal Area Objectives	Trust Fund	Indicative Grant Amount (\$)	Indicative Co-financing (\$)
CCM 3 - Investment in renewable energy technologies increased	GEF TF	1,725,000	12,622,000
Total Project Cost		1,725,000	12,622,000

B. INDICATIVE PROJECT FRAMEWORK

Project Objective: To increase access to energy in selected remote, rural areas in Malawi by promoting innovative, community-based mini-grid applications in cooperation with the private sector and civil society.						
Project Component	Grant Type ³	Expected Outcomes	Expected Outputs	Trust Fund	Indicative Grant Amount (\$)	Indicative Cofinancing (\$)
1. Expansion of the Mulanje Electricity Generation Agency (MEGA) micro-hydro ⁴ power plant (MHPP) and mini-grid scheme	TA/ INV	- Increasing the installed capacity of MEGA's MHPP scheme to 284 kWp by end of year 3 of project - Achieving MEGA's business target of increasing aggregate	1.1 Construction and commissioning of Lilulezi (40 kWp) and Fort Lister (40 kWp) MHPPs ⁵ 1.2 Yearly energy output of 490,000 kWh /year from commissioning of two MHPPs	GEF	300,000 (INV) 200,000 (TA) = 500,000	2,696,000

¹ Project ID number will be assigned by GEFSEC.

² Refer to the reference attached on the [Focal Area Results Framework](#) when completing Table A.

³ TA includes capacity building, and research and development.

⁴ For the purpose of this project a micro-hydro power plant (MHPP) is defined as an installation ranging from 5 kW to 100 kW that provide power for a small community in remote areas away from the grid

⁵ Lilulezi and Fort Lister were selected since they the MHPPs sites that already have forecasted EPC budgets as per the MEGA business plan

		household energy savings among customer base of US\$391,000 per year by 2017/2018	<p>1.3 MEGA successfully meeting its tariff pricing, supply efficiency⁶ and financial targets (as codified in its business plan) for all sites by end of project</p> <p>1.4 MEGA established as a viable social enterprise⁷, enabling further growth and project development</p> <p>1.5 MEGA's model is showcased and disseminated as a "national case study" for community-based mini-grid development in Malawi</p>			
2. Replication of MEGA model via piloting of two (2) mini-grid schemes in either the Karonga and Chitipa districts (Northern Region) ⁸	TA/ INV	- Investment in at least 80 kWp of sustainable mini-grid schemes established in Northern Region based on MEGA model and regional best practice s	<p>2.1 Basic pre-feasibility assessments and load forecasts done for mini-grids at two sites in targeted districts⁹</p> <p>2.2 Sensitization campaign conducted with district councils and community groups in targeted areas</p> <p>2.3 Legal establishment of independent mini-grid operator in one of two targeted districts with approved generation/ transmission licenses, governance structure, tariff policy and investment plan</p> <p>2.4 Construction and commissioning of two MHPP or solar/wind hybrid schemes (at least 80 kWp total installed capacity)</p> <p>2.5 Yearly energy output of at least 450,000 kWh/year from commissioning of</p>	GEF	<p>300,000 (INV)</p> <p>300,000 (TA)</p> <p>= 600,000</p>	3,844,000

⁶ Forecast at 350 days per year availability and a take up/utilization rate of 70% of capacity per site as per MEGA business plan

⁷ MEGA is forecast to be self-sustaining after implementation of five schemes; the income from electricity sales will exceed the overhead costs to enable MEGA to operate with external finance.

⁸ The National Water Resources Master Plan for Malawi prepared by the Government of Malawi with the assistance of the UNDP identified potential sites for the development of small to mini hydro power schemes: A total of 12 potential sites have been identified in the Northern Region alone. All of them are within Karonga and Chitipa districts and these are: North Rukuru 1, 2, & 3, upstream & downstream Lufira, Kalenje, Kaseye, Wovwe, Chitimba, Chambo Mbalizi and Songwe. Out of these sites, only Wovwe has been developed with an installed capacity of 4.5MW.

⁹ The choice of which district to be targeted between the two (as regards hosting the mini-grid schemes) will be made at PPG phase; for micro-hydro sites they will be identified as part of the JICA RE Master Plan (2002) and its updated version

			two plants by end of project ¹⁰ 2.6 Sustainable O&M&M models demonstrated for all mini-grid schemes			
3. Institutional strengthening and capacity building for promotion of decentralized , mini-grid applications across the country	TA	- Increased capacity of government, private sector and community stakeholders to develop and plan decentralized energy projects across the country in a systematic fashion - Increased awareness about relevant business models, regulatory needs and sustainability of mini-grids in Malawian context	3.1 National clearinghouse mechanism for mini-grid developers and investors established 3.2 Training for both developers and community stakeholders on basic RE/hybrid mini-grid cost-benefit analysis 3.3. Support for dissemination of REN21Africa Mini-grid toolkit ¹¹ 3.4 Support to 14 District Executive Committees (DEC) to establish and operationalize district plans for decentralized clean energy applications with accompanying information sharing platforms in place	GEF	485,000	5,734,000
Subtotal					1,585,000	12,274,000
Project Management Cost (PMC) ¹²				(select)	140,000	348,000
Total Project Cost					1,725,000	12,622,000

C. INDICATIVE CO-FINANCING FOR THE PROJECT BY SOURCE AND BY NAME IF AVAILABLE, (\$)

Sources of Co-financing	Name of Co-financier	Type of Co-financing	Amount (\$)
National Government	Ministry of Energy - Department of Energy Affairs (DEA)	Cash	\$800,000
National Government	Ministry of Environment and Climate Change Management	Cash	\$200,000
National Government	Malawi Energy Regulatory Authority (MERA)	In-kind	\$200,000
Local Government	Selected District Councils (Districts of Mulanje, Karonga and/or Chitipa)	Cash	\$90,000 ¹³
Multilateral donor	World Bank	Cash	\$2,900,000
Bilateral donor	Malawi Renewable Energy Acceleration Program (M-REAP) / Government of Scotland	Cash	\$3,000,000
Bilateral donor	Business Innovation Facility - Malawi /DFiD	Cash	\$2,000,000
Bilateral donor	Japanese International Cooperation Agency (JICA)	Cash	\$200,000
Private Sector (social enterprise)	Mulanje Electricity Generation Agency (MEGA)	Cash	\$542,000
NGO	Practical Action	Cash	\$250,000 ¹⁴

¹⁰ Energy output cited is pro-rated based on MEGA MHPP sites; the system design, capacity factors and energy output will be defined at PPG phase based on the pre-feasibility study outcomes and depending on whether it's a micro-hydro or solar/wind hybrid scheme.

¹¹ For more information on the Mini-grid Tool Kit sponsored by REN21 See Section A. 4

¹² To be calculated as percent of subtotal.

¹³ 30,000 USDk from each target district

NGO	World Future Council	Cash	40,000
GEF Agency	UNDP - Private Sector Development project	Cash	500,000
GEF Agency	UNDP - Sustainable Energy Management (SEM) Support to Malawi project	Cash	1,900,000
Total Co-financing			12,622,000

D. INDICATIVE TRUST FUND RESOURCES (\$) REQUESTED BY AGENCY, FOCAL AREA AND COUNTRY¹

GEF Agency	Type of Trust Fund	Focal Area	Country Name/Global	Grant Amount (\$) (a)	Agency Fee (\$) (b) ²	Total (\$) c=a+b
UNDP	GEF TF	Climate Change	Malawi	1,725,000	163,875	1,888,875
Total Grant Resources						

E. PROJECT PREPARATION GRANT (PPG)¹⁵

Please check on the appropriate box for PPG as needed for the project according to the GEF Project Grant:

	<u>Amount Requested (\$)</u>	<u>Agency Fee for PPG (\$) ¹⁶</u>
• No PPG required.	-- 0--	--0--
• (up to)\$100k for projects up to & including \$3 million	<u>100K</u>	<u>9,500</u>

PART II: PROJECT JUSTIFICATION¹⁷

PROJECT OVERVIEW

A.1. Project Description

Global environmental problems, root causes and barriers that need to be addressed

Malawi is one of the poorest countries in the world, with a headcount poverty incidence rate of 50% and a ranking of 153 out of 177 countries in the latest United Nations Human Development Index (an estimated GNI per capita of US\$280). It is one also of Africa's most densely populated countries, with a population of 15.3 million as of 2009 and a population growth of 2.8%, expected to reach 22.4 million by 2025.

Provision of sufficient and reliable energy in Malawi for accelerated sustainable development is a major challenge. The country has a total installed hydropower capacity of capacity of 315 MW, but only 282.5 MW is currently being generated since many units are frequently taken out of service for repairs. Malawi generates 98% of this grid-supplied electrical power through six run-of-river hydropower projects on the Shire River. The Electricity Supply Corporation of Malawi (ESCOM) is a vertically-integrated, Government-owned electric utility that generates, transmits and distributes electric power to about 203,000 customers. Malawi has one of the lowest per capita electricity usage rates in Africa – see Figure 1. Only about 8% of the total population has access to electricity, mostly in urban centers. For the 80% of the people living in rural areas, access to electricity is less than 1%, *among the lowest electrification rates in the world¹⁸*.

¹⁴ Practical Action and other donor funding contributions are subsumed together with MEGA electricity sales as baseline co-finance for MEGA in the baseline section – see Table 1

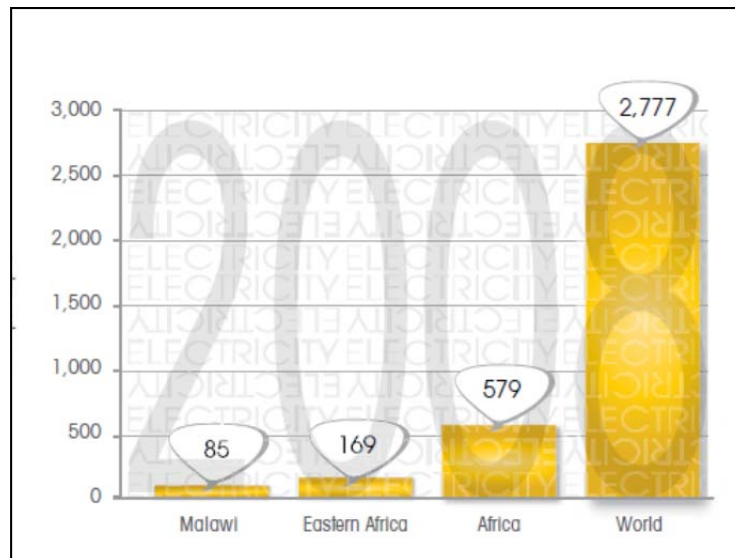
¹⁵ On an exceptional basis, PPG amount may differ upon detailed discussion and justification with the GEFSEC.

¹⁶ PPG fee percentage follows the percentage of the GEF Project Grant amount requested.

¹⁷ Part II should not be longer than 5 pages.

¹⁸ Sustainable Energy for All, *Malawi - Rapid Assessment and Gap Analysis*, June 2012

Figure 1 – Malawi Electricity Use per Capita / kWh per capita (2008 – IRENA)



Peak demand in Malawi is currently estimated at about 344 MW and demand is expected to increase at a rate of 5 percent annually over the next decade. Currently, electricity supply cannot meet demand and new capacity is urgently needed in the generation system. Load shedding is a regular day-to-day occurrence for all but priority customers of ESCOM, and is estimated to frequently exceed 35MW, or over 10% of peak demand.¹⁹ ESCOM currently has a significant backlog of new connections, both from residential and industrial customers (including mining customers), resulting in significant suppressed demand in the system. The generation capacity deficit, the dilapidated condition of the distribution network and ESCOM's severe cash flow constraints together mean that ESCOM is severely limited in the number of new connections that can be made. As noted in a recent World Bank report, to meet both currently suppressed demand as well as projected future demand, Malawi would need to have in place by 2015 an estimated additional 140 MW of available capacity.²⁰ Moreover due to the highly undiversified sources of power, Malawi faces significant hydrological risks. The fact that 98% of ESCOM's generating capacity power production is dependent on the flow of one river basin renders Malawi highly vulnerable to fluctuations in rainfall patterns.

Malawi is heavily reliant on biomass for its cooking energy requirements, especially firewood and charcoal, which account for 95 per cent of national energy requirements for cooking. The overall wood consumption exceeds sustainable supply by about 2.37 million cubic meters per year, equivalent to 50,000 hectares of woodland deforested per year. The Malawi Energy Policy (2003) estimates that 48% of the biomass used comes from sustainable supply, 47% comes from natural woodlands (unsustainably harvested) and 5% comes from agriculture and industrial sector wastes. As noted in Figure 2 below showing Malawi's energy mix by fuel type, households account for most biomass demand for thermal applications with the majority of the population using paraffin and candles for lighting purposes. Uptake of solar home applications is still limited but growing; no updated figures are available (according to an inventory of solar systems done by the Centre for Social Research as part of a study commissioned by UNDP in 2005²¹ it was noted that there were around 10,000 solar home systems throughout Malawi however only about 5,000 systems were functional). Widespread use of renewable energy thermal systems such as solar water heaters is still very low and confined to urban areas; the same situation applies to the use of LPG for cooking and heating. At industrial and commercial levels, application of energy management principles and consideration of both financial and environmental benefits are not systematically measured. Coal is the major source of industrial process heat.

¹⁹ Project Appraisal Document, Energy Sector Support Project – Malawi, World Bank, June 2011

²⁰ Ibid

²¹ Centre for Social Research (2005), "Baseline Inventory/ Development Impact Survey of Solar Photo Voltaic and Thermal Systems in Malawi", Final Report.

Figure 2 – Malawi Energy Mix by Fuel Type

Sector	Energy demand by fuel type (TJ/ yr)				
	Biomass	Petroleum	Electricity	Coal	Total
Household	127,574	672	1,798	5	130,049
Industry	10,004	3,130	2,010	3,481	18,625
Transport	270	5,640	35	15	5,960
Service	452	558	477	174	1,661
Totals	138,300	10,000	4,320	3,675	156,295
%	88.5	6.4	2.8	2.4	

Source: Malawi Biomass Energy Strategy - BEST (2009), Matthew Owen et al.

As expected from an economy highly dependent on natural resources and biomass-based energy, Agriculture Forestry and Other Land Use (AFOLU) account for 95% of the country's total GHG emissions. However Malawi's energy sector is second at 3.4%, with the three main source categories responsible for the bulk of GHGs emissions in the energy sector as follows: (i) gasoline and diesel; (ii) motor gasoline; and (iii) sub-bituminous coal. These sources are followed by kerosene (paraffin) which is mostly used for domestic cooking and lighting. The results from the latest second national communication indicate that on average Malawi emits around 22,708 Gigagrammes (Gg) of carbon dioxide equivalent and is therefore a net emitter of GHGs.²² In recent years Malawi's supply potential of biomass fuels has declined in almost all regions as a result of massive deforestation that is now contributing to soil erosion, floods, destruction of catchments areas for water, drought and reduction of agricultural productivity – all of which are accelerating the country's chronic poverty.

Recent Developments and Opportunities in the Energy Sector

Over the last decade the Government of Malawi has developed a number of strategies and new initiatives in the energy sector. The Power Sector Reform Strategy (PSRS) approved by the Government of Malawi in 2003, provided for the unbundling of ESCOM and private sector participation via long term concessions in transmission and distribution and entry of Independent Power Producers (IPPs) for new on-grid generation capacity. Consistent with these strategies, a set of legislation was approved by Parliament in 2004, including the Energy Regulation Act, an Electricity Act, a Liquid Fuels and Gas Act, and a Rural Electrification Act. With support from donors such as the Millennium Challenge Corporation (MCC) and the World Bank, as well as UNDP under their new *Sustainable Energy Management Support to Malawi* program (see Section B.3), many of the national-level reforms and institutional requirements required for development of renewable energy are underway.

Given the structural capacity deficit, the government now recognizes the need to promote and provide reliable and low-cost quality electricity to meet the needs of low income customers, particularly those in the rural areas. **The development of new decentralized generation capacity is now receiving more attention in order to increase access to electricity and encourage income-generating activities such as cottage industries (small-scale milling, agro processing, community water supply and irrigation) and productive uses.** With assistance from the Government of Japan, the Department of Energy Affairs formulated a Rural Electrification Master Plan with the aim to increase access to electricity to not less than 30% of the population by the year 2030. Malawi also implemented the GEF-funded *Barrier Removal to Renewable Energy in Malawi (BARREM)* project which changed the landscape for RETs in the country and has led to increased national awareness about RETs and a host of new pilot projects and training programs. Last year the government officially signed on to the Sustainable Energy for All (SE4A) initiative goal and committed to the following national targets:

- **To improve access to electricity to 15% by 2015, 20% by 2020 and 30% by 2030.**

²² Second National Communication to the UNFCCC, Malawi, Ministry of Natural Resources, Energy and Environment, Oct 2011

- To improve the use of energy efficient end-use devices by 1% by 2015, 5% by 2020 and 10% by 2030.
- **To increase the contribution of RES in the mix by 1% by 2015, 3% by 2020 and 6% by 2030.**²³

Meanwhile a number of studies have confirmed that Malawi is endowed with abundant renewable energy resources, particularly as regards hydro and solar. The average solar insulation level in Malawi is about 20MJ/m², which is relatively high.²⁴ For wind energy systems, there are quite a good number of areas in the country with mean wind speeds above 5 meters per second for the majority of the year. Indigenous hydropower potential – particularly micro schemes – is massively under-exploited. To cite just one example, a JICA-funded study in 2002 indicated that Malawi has an SHPP potential of 7.35 MW from 22 sites and identified a further 345 kWp of micro-hydro potential, mostly located in the Northern Region of the country bordering Tanzania and areas surrounding Mulanje Mountain in the Southern Region, the wettest mountain in Southern Africa with annual rainfall of between 2,000 - 4,000 mm. This renewable energy potential is set against indigenous coal reserves that are currently exploited only on an informal basis, and petroleum imports that carry a high transportation cost burden. Since ESCOM's financial resources are scarce, the government has recognized that investments for new generation (both on-grid and off-grid) can only be leveraged by involving the private sector, community organizations and social enterprises.

Among the most promising examples of this newfound interest in decentralized energy supply and the piloting of innovative community-based delivery models is the establishment of the Mulanje Electricity Generation Agency (MEGA), Malawi's first vertically-integrated, community-based independent supply company – generating and supplying electricity on its own network independent of the national grid (more info can be found in the baseline section).²⁵ Founded by a consortium of three community-based NGOs – the Mulanje Mountain Conservation Trust (MMCT), the Mulanje Renewable Energy Agency (MUREA) and Practical Action (PA) – MEGA has been incorporated as a social enterprise (limited liability company). With support from a consortium of donors and community groups, MEGA has recently commissioned the first of 10 pilot MHPPs, an 88 kWp micro-hydro plant and mini-grid at Bondo on the Lichenya River. The Bondo scheme will serve 400 households, a business center, schools, a clinic and a maize mill. Following extensive consultation with the community, MEGA has established its own governance structure; operational staff; maintenance scheme; and connection and cost-reflective, graded tariff pricing policy (utilizing pre-paid meters). A business model is now in place based on the expansion of nine additional MHPPs established over the next six years in the Mulanje District (two new SHPPs are under construction), with the target of MEGA becoming a fully self-sufficient entity by the beginning of year six. MEGA's business model views ESCOM as a partner and collaborator in meeting the demand for electricity in the communities around Mount Mulanje and they work closely with both the DoE and MERA. Several other NGOs – including Renew'N'Able Malawi (RENAMA) – are piloting similarly innovative decentralized schemes in line with the MEGA model, while DoE has established six stand-alone 20.1 kWp village solar-wind hybrid stations and mini-grids in the South, Center and Northern regions of the country. Each of these mini-grid schemes power 150 households and many other districts have expressed an interest in hosting such schemes.

Such approaches offer tremendous promise for replication and scale-up across Malawi. In addition to the mini-grid model, with the introduction of the government's feed-in tariff policy paper²⁶ new micro- and small-scale generation plants could alternatively be connected to the grid. However as noted in the Gaps and Barriers section of the SE4A Rapid Assessment, the successful expansion and replication of such schemes is predicated on “*access to capital for increasing generation capacity – off grid, mini/micro hydro systems.*” Moreover even with a verified resource base and access to upfront capital costs for the actual hardware, following the MEGA experience there remains a huge need for associated technical assistance and community-based sensitization and capacity-building at the district level to create the requisite capacities and governance structures to operate and maintain such schemes. For any district contemplating such schemes there is firstly a need to support district

²³ See Footnote #10

²⁴ Malawi Government – *Concept paper for the Energy Sector – PPPs on Electricity Generation for Rural Areas*, Millennium Challenge Account - Malawi Country Office, 2011

²⁵ A full description of MEGA is included in Table 1 in the Baseline section

²⁶ Malawi Energy regulatory Authority, Malawi Feed-in Tariff Policy, Draft September 2012

councils to establish and operationalize district, area and village plans for roll-out of the appropriate RETs and mainstream renewable energy considerations into District Development Plans and Actions. Finally although the climate of doing business in Malawi has improved in recent years as the Government has shifted its policy in favor of provision of services by the private sector, the enabling environment for private sector and PPP participation in the energy sector remains a work-in-progress with many of the required regulatory instruments for IPPs still not finalized and no national clearinghouse established. Moreover there remain widespread lack of awareness about the relevant best practice business models, regulatory needs and sustainability of mini-grids in Malawian context.

Problem Statement: Malawi is one of the least electrified countries in the SADC region, with an average per capita consumption of 111kWh per annum – among the lowest in the world. Provision of sufficient, reliable and clean energy in Malawi is a critical challenge, as recognized by the Government which has put energy as a focus area in both the Malawi Growth and Development Strategy II (MDGS 2011 - 2016) and the Economic Recovery Plan (2012). The demand for electricity by far exceeds the installed capacity and new generation capacity is urgently needed, with the government focused on promoting diversified sources and utilization of the country's abundant renewable energy resources – particularly micro-hydro and solar. Under SE4A the government has committed to ambitious 2015/202 targets for increasing energy access and renewable energy supply.

To increase access, effort is needed to develop power plants close to the end users in the rural areas and since financial resources are scarce, investments for new generation can only be leveraged by involving the private sector and social enterprises. In recent years various innovative, decentralized approaches – including mini-grids – have been piloted in the country by both Government and social enterprises and have been shown as an affordable and efficient ways to meet these goals, most prominently demonstrated by the establishment of Malawi's first mini-grid, independent vertically-integrated utility – the Mulanje Electricity Generation Agency (MEGA). **However as noted in the SE4A gap analysis, the replication and expansion of such approaches is hindered by lack of access to upfront financial resources; the need for further capacity-building support and institutional strengthening at the district level; and lack of awareness of the relevant business models and regulations needed to develop such off-grid rural electrification platforms.**

The main barriers to development of clean and affordable decentralized mini-grid applications are as follows:

Barrier 1: Lack of access to upfront capital costs

One major hurdle for installing mini-grid (particularly hydropower) technology in developing countries is the upfront investment costs and Malawi is no exception. The development of greenfield mini-hydro sites in Africa tends to be expensive, particularly for plants with capacities of less than one MW where the specific (per kW) electromechanical costs can be very high and dominate total installed costs. Whereas a community might have satisfactory liquidity over time, there is usually limited capacity within underdeveloped local banking systems – Malawi is a case in point – to allow for upfront investments even with aggressive payback schemes. Even for large-scale on-grid investments, in order to attract PPPs in the power sector one can assume that the viable financial internal rate of return should not be less than the base commercial lending rate, which in Malawi in mid-July stood at 21%. As such, even with accompanying good planning for a high plant factor and well balanced load pattern in the MHPPs, the payback for any developer is extremely challenging without any subsidy of the upfront capital costs. In order for off-grid RE projects to be financially viable, government, donors and the private operator need to establish partnership models and performance-based schemes that will outline how capital costs will be subsidized for a limited period of time to cover full costs of operations. Initial assessments on increasing access to rural areas in Malawi have shown that there are initially low commercial returns to investments when investing in rural areas but that many rural consumers do have the ability to pay cost-reflective tariffs if the barrier of upfront capital costs to establish energy services is overcome. As an example, MEGA's current tariff charge to customers (approved by the community) is set at just over twice the level of ESCOM. Although this appears high, when compared to prices paid for energy in the informal rural sector, MEGA's pricing is forecast to reduce household expenditure on basic energy needs by a factor of 17.

Barrier 2: Low awareness and institutional capacity at the district and community level to develop, operate and maintain mini-grid schemes

There exists in Malawi a fairly well established institutional set up to handle energy affairs at national level. However at district level such structures are missing; the Department of Energy has no presence at district level to plan and implement energy activities and District Executive Committees (DEC) do not have access to information about decentralized programs and technologies to incorporate into District Development Plans and Actions. The new UNDP Malawi Project Support Document: Sustainable Energy Management Support to Malawi (See Section B.3) identifies lack of technical capacity at the district level as among the main institutional barriers inhibiting RE planning and roll-out. That project document notes that *“DoE does not have personnel at the district level in line with the decentralisation policy. All operations are managed from the head office. Therefore, implementation of specific activities will largely depend on the network of partners that have representation at the district, area and village level, such as District Forestry Officer and Forestry Assistants as well as Agriculture Officers...It was also noted that the link between national planning and district implementation is constrained by lack of both human and financial resources. In addition, formal communication structures are undefined, weak and in some cases non-existent. Weak interaction with and involvement of the private sector and local entrepreneurs in the execution of policies also indicate significant gaps preventing the effective uptake of national initiatives for renewable energy and energy efficiency.”*²⁷

Moreover while the NSREP, BARREM and various other past RE demonstration projects have generated extensive information, it has not been codified and institutional lessons have often not been learned as regards the link between business models, regulatory needs and sustainability of mini-grids. For example a major lesson learned from many of the government-funded, village solar-wind hybrid stations and mini-grids is that there was not sufficient attention paid to community sensitization on the need for community members to pay for the energy provided and identify the structures to collect tariffs for ongoing operations and maintenance of the mini-grids. For any mini-grid energy project aiming for commercially viable there is a need for analysis and awareness to assess the following as part of the design of the project:

- (a) The probable uses that are expected to demand the required power needs that will determine the level and type of technology required and availability of resources for power generation;
- (b) The level of tariffs or user fees that customers are willing to pay based on the level of usage; and
- (c) Determination of price structures that are affordable based on categories of customers.

This was also noted as a major challenge in the BARREM final evaluation report, which noted that large numbers of government and donor-funded RE installations are now non-operative despite having showed high demand for energy services; this is mainly due lack of sustainable operational models and proper maintenance (this was also highlighted in a recent report by M-REAP).

²⁷ Malawi Project Support Document: Sustainable Energy Management Support to Malawi, April 2013

Barrier 3: Lack of systematic information-sharing and data collection on best practices to scale-up mini-grid development, particularly as regards engagement of private sector and NGO actors

Numerous studies on the necessary conditions for successful mini-grid development have highlighted the interrelated need to simultaneously engage the private sector to ensure high levels of maintenance and quality as well as engage public sector actors (both as regards government and donors) to develop a programmatic approach and streamline access to the required subsidy/financial support during the initial years of mini-grid roll-out to build skills and develop the market.

Under present circumstances in Malawi there is little opportunity for the best practices and lessons learned of an innovative PPP scheme such as MEGA to be shared with other districts with similar resource potential or be systematically codified. There is no structure in place to systematically identify promising concepts, resource assessments and pilot studies for up-scaling and be able to make informed suggestions to development aid agencies or local NGOs based on demonstrated facts of successful approaches from other districts. Nor do many interested developers and community stakeholders have knowledge of the basic tools for RE/hybrid mini-grid cost-benefit analysis or access to regional resources on mini-grid best practices. At a governmental level there is not yet a clear and feasible set of customized options for mini-grids, including policy measures and frameworks as well as the linkage to financing models and capacity building requirements. The establishment of CONREMA (see baseline project #5) is promising but a recent development.

The absence of such structures and platforms has a particularly negative impact on private sector, social enterprise and community-based actors who are at present the leading actors implementing decentralized energy applications in Malawi and who are expected to be the key drivers of expanding energy access going forward. The current government program of extending grid electricity – mainly funded by a locally generated Energy Fund from a levy on energy sales (this includes both fuel and electricity)²⁸ – is not appropriate or cost-effective for many areas. While using these resources the DEA has been able to implement a few mini-grids, but funds remain limited and so IPPs such as MEGA offer the most effective way for the government to meet the objectives of SE4A in the short- to medium-term.

The baseline scenario and any associated baseline projects

A number of government- and donor-financed initiatives supporting renewable energy technologies and mini-grids are either underway or under development. The major baseline activities of relevance to this project (excluding UNDP's baseline contributions which are highlighted in Section B.3) are as follows:

Table 1. Summary Overview of all Relevant Baseline Activities

Baseline Project #1 – Mulanje Electricity Generation Agency (MEGA) mini-grid schemes in Mount Mulanje

MEGA is Malawi's first vertically-integrated, community-based independent energy supply company generating and supplying electricity on its own network in Mulanje District. The mission of MEGA is: *"To provide an energy supply that is widely available and reliable at an affordable cost and supplied in an environmentally and financially sustainable business model."*

MEGA is an organization shaped and driven by 3 key groups of stakeholders:

- Local communities from around Mount Mulanje who have normally been excluded from access to affordable and clean energy;
- Founder NGOs [Mulanje Mountain Conservation Trust (MMCT), Mulanje Renewable Energy Agency (MUREA), and Practical Action (PA)] who provide complementary expertise and missions aligned to address poverty and environmental challenges by supporting energy access in rural areas;

²⁸ Under this scheme the Government contracts ESCOM to extend the grid to designated rural centre. Once this is achieved, ESCOM takes the responsibility of operating and maintaining the distribution lines.

- Donor funders – fully aligned to the principle of providing clean and affordable energy to rural communities. Over US \$1.5 million has already been invested in MEGA to date by USAID, OFID, EC, DFID and the Scottish government.

MEGA has been incorporated in Malawi as a social enterprise (a registered company limited by shares). The Board of MEGA is made up of representations from the founder NGOs, the Community Trust, expert non-executives and other key investors and donors. An advisory panel supports the board and includes representation from the government energy bodies, the Mulanje District Council and other identified non-executive experts. The MEGA project has been delivered to date under the joint management of a 'founding team'. The founding team was responsible for launching the first site and establishing an operational executive responsible for delivering the business plan of MEGA. A full-time managing director/CEO is now being hired.

MEGA's business model is predicated on the founding principles of ensuring the 'affordability' and 'wide availability' of its electricity supply. Based on this, MEGA will implement 'expansionist' and 'price minimization' policies. It will develop a multi-site strategy, replicating hydro schemes around Mount Mulanje and will maximize on-site sizes. Tariff rates will be kept as low as is possible while balancing the need to deliver a financially sustainable business. The Community Trust will represent all communities around the mountain and MEGA will contribute 1% of its net sales to the trust to enable further RET activities to be targeted in the area.

As noted in its business plan, MEGA will supply 3 customer groups: households, businesses and community assets. Community assets such as schools and clinics will not be charged for their energy supply, however households and businesses will be charged at a graded tariff.

MEGA's operational activities are split into five key areas: Generation; Supply management; Site and network maintenance; New site development; and Business development. Technical design and operational procedures is primarily guided by Practical Action, who will utilize and pass on to MEGA and MUREA their extensive experience in setting up community based micro-hydro schemes in other countries. MEGA has overall responsibility for its operational activities; however it shares control of delivery with the community in respect of generation and site maintenance, and will subcontract responsibility for new site development to MUREA.

The Bondo site on the Lichenya river is the first MHPP (88 kWp) to be developed in Mulanje as part of the MEGA project. It was the result of joint collaboration between:

- Beneficiaries: Bondo community in Mulanje;
- Primary sponsors: Mulanje Mountain Conservation Trust (MMCT);
- Principle site developers: Mulanje Renewable Energy Agency (MUREA);
- Key technical partners: Practical Action (PA)
- Principle donors: European Commission (EC)

The Bondo site received final approval in 2008 with agreement between the Bondo community and MMCT/MUREA and construction began in 2009. The capital costs for the Bondo project were primarily funded by the EC, however other support has been committed/received from a number of donors including the OPEC Fund for International Development (OFID); DFID (via its Business Innovation Facility - BIF); and the Scottish Government. Support has also been committed to MEGA from a number of other parties such as the South African metering firm, Conlog, who have offered pro-bono consultancy time and meters at wholesale price and BIF has supported MEGA with legal structuring, financial modeling and business planning.

The construction process for Bondo was led by MUREA, with close support from PA and collaboration with the community. A weir system, water channels and generator house have been constructed and the setting up of poles and transmission lines successfully completed to all households, businesses and community assets in the area. Bondo has a 3 jet pelton turbine, design flow of 0.2m³/s and 65 meter head. The fully-loaded costs of establishing Bondo (EPC basis) was approximately USD \$406K which includes both site preparation, plant installation, transmission and distribution, pre-paid meters and associated consulting costs.

The incorporation of MEGA and development of Bondo was done in close cooperation with the various relevant government energy bodies: Department of Energy (DoE); Electricity Supply Commission of Malawi (ESCOM); and the Malawi Energy Regulatory Authority (MERA). MERA has issued MEGA with all the required licenses. As well as keeping the agencies informed as to progress, MEGA receives close monitoring and supervision as to technical and

safety compliance at staged intervals. A detailed community consultation process was undertaken as part of Bondo so as to ensure expectations and motivations are aligned and that the final business model and tariff pricing scheme was adopted by the end users.

MEGA has a fully developed business plan (available for reference upon request), financial model and a planned list of an additional 406 kWp of other MHPP sites mapped for future development (total estimated capital cost of US \$2.419 million). MEGA's current financing needs are two-fold: 1) Operational financing of its operations and overheads; and 2) Capital expenditure financing of its planned site builds.

Current commitments to MEGA for the project period include:

- USD \$300K from OPEC Fund for International Development (already transferred to MEGA budget)
- USD \$250K from Practical Action
- USD \$242K from MEGA in re-invested earnings from forecasted electricity sales

Sub-total: USD \$792K (2013-2017 – includes both donor – external – and internal MEGA contributions)

Baseline Project #2 – Ministry of Energy - Department of Energy Affairs (DoE) (Various rural electrification initiatives / Ministry of Environment and Climate Change Management / Malawi Energy Regulatory Authority (MERA))

The Malawian Government, through the DoE, has a number of ongoing programs to enhance the sustainability of energy resources through promotion of alternative energy sources. With assistance from the Government of Japan, DoE formulated a Rural Electrification Master Plan with the aim to increase access to electricity to not less than 30% of the population by the year 2030.

The major programs currently underway (total budget of USD \$800K) are:

- 1) Malawi Rural Electrification Project (MAREP) which aims at extending electricity grid to rural area and is locally funded through an energy fund derived from fuel levy. This an on-going program;
- 2) Promotion of Alternative Energy Sources Project (PAESP) targeted to reduce Malawi's reliance on firewood and charcoal as main sources of energy. and
- 3) Support for the establishment of mini-grid, solar-wind hybrid schemes.

Ministry of Environment and Climate Change Management includes the Department of Climate Change and Meteorological Services which has one of its core functions of the Department is to provide weather and climate data and information for various socio-economic sectors, including energy. They are currently collecting rainfall and hydrological data across the country for support in assessing energy potential from hydro sites as well as solar irradiation data for solar thermal and photovoltaic systems (total budget of USD \$200K over project period).

Together with support from the World Bank (see baseline project #6), MERA is working on various regulatory initiatives as regards the renewable energy sector (total budget of USD \$200K over project period).

Sub-total: Combined USD \$1.2 million for 2013-2017 period

Baseline Project #3 – JICA / Various policy- and project-related support programs for promotion of renewable energy technologies

JICA has traditionally been a major donor in the Malawian energy sector and in 2002 funded one of the country's first assessments of the country's hydrological potential. It is currently supporting the following relevant activities in the renewable energy sector:

- Installation of 850 kWp solar farm at the Lilongwe airport (already disbursed)
- Support for an updated assessment of the country's hydro power generation potential for the updated Malawi Power Sector Investment Plan (2010)
- Support for pre-paid meters as part of MAREP
- Secondment of an renewable energy advisor/expert in the DoE

Sub-total: Estimated USD \$200K (2013-2018)

Baseline #4 – Malawi Renewable Energy Acceleration Program (M-REAP) / Government of Scotland, Strathclyde University and various local and international partners

The Scottish Government International Development Fund (SG IDF) commissioned a scoping study on Supporting Community Energy Development in Malawi in 2011. Following that study Strathclyde University received an award of £1.7 million (\$3 million USD) from the Government of Scotland to implement the Malawi Renewable Energy Acceleration Programme or M-REAP. This project builds upon on a previously successful Community Rural Electrification and Development (CRED) project between Scotland and Malawi. That project provided seven solar energy systems in schools and health posts, as well as in eight teachers' houses. The objective of M-REAP is to reduce poverty and tackle climate change and to empower disadvantaged communities in remote rural areas of Malawi to develop and sustain a variety of appropriate, affordable and sustainable renewable energy projects at the village level. To achieve this objective, M-REAP will work in conjunction with the Government of Malawi and other key stakeholders to accelerate the growth of community and renewable energy development through multiple, targeted and coordinated activities. MREAP has four main components:

- 1) Institutional Support Programme (ISP) – Outcome 1: Malawian institutions have evidence and systems to support the effective development of the renewable energy sector to provide development benefits for rural communities
- 2) Community Energy Development Programme (CEDP) – Outcome 2: Effective Community Renewable Energy deployments are facilitated by capable stakeholders within government, civil society, communities and private sector to support the effective development of the renewable energy sector to provide development benefits for rural communities
- 3) Wind Energy Preparation Programme (WEPP) – Outcome 3: Effective wind power resources are deployed by capable stakeholders within government, civil society, communities and private sector to
- 4) Renewable Energy Capacity Building Programme (RECBP) – Outcome 4: Higher Education Institutions, trainers and entrepreneurs have the knowledge of renewable energy to support the effective development of the renewable energy sector to provide development benefits for rural communities

M-REAP involves a number of Scottish and Malawian partners. Scottish partners include the International Organization Development Ltd. (IOD PARC), Community Energy Scotland (CES), and SqurrEnergy. In Malawi, the management of M-REAP rests with the Centre of Water, Sanitation, Health and Appropriate Technology Development (WASHTED) at the University of Malawi - Polytechnic. Other partners include MUREA, Concern Universal, ESCOM, DoE, Opportunity International Bank of Malawi and the University of Mzuzu.

Scotland has also funded a community renewables toolkit to assist communities and community-support organizations in improving access to energy services in developing countries. This work is well underway, being developed by Scottish Government partners both in Scotland and in Malawi. A pilot version of the toolkit will be tested later this year by staff from Community Energy Malawi, a locally-based organization, and a refined and final version launched by the end of March 2014. The Scottish government also has a formal agreement in place with the Government of Malawi to second two Scottish Government members of staff to Malawi to offer support in developing renewable energy and climate change strategies for the country.

Sub-total: **USD \$3 million committed (2012-2016)**

Baseline #5 – Business Innovation Facility - Malawi /DFiD – Phase II

The Business Innovation Facility is a three-year pilot program running from July 2010 to December 2013 (with a design phase now underway for a second phase), funded by the UK Department for International Development (DFID) and managed by PricewaterhouseCoopers LLP and its Alliance Partners. Malawi is one of five Business Innovation Facility pilot countries.

BIF has provided and continues to provide significant advisory support to MEGA as regards financial planning and investment facilitation and has also provided similar support to several other low-carbon energy projects in Malawi. BIF is organizing an off-grid energy entrepreneurship workshop in Malawi in September 2013 intended to assist in coordinating all programs being initiated by development partners and the government in renewable energy. That workshop will also launch the "Cooperation Network for Renewable Energy in Malawi (CONREMA)", a new network which aims to harness knowledge and capacities within the country to achieve higher cohesion and sustainability with RE projects. BIF is now conducting a design phase for Phase 2 starting in October 2013 and it is expected that

renewable energy will be selected as one of the focus sectors for assistance. As part of Phase II BIF is expecting further DFID funding of approximately £5 million pounds commencing in early 2014. At present it is not known how much of that amount will be directed toward RE investments or projects.

Sub-total: USD \$2 million (conservative estimate of amount of BIF funding dedicated to RE projects and investments – including MEGA – over the project period 2013-2017)

Baseline #6 – World Bank Energy Sector Support Project (ESP) / Component 4 – Capacity Building and Technical Assistance to the Ministry of Energy)

ESP is a large US \$84.7 million grant and credit project funded by the World Bank that focuses on four components: (i) rehabilitation, upgrading and expansion of existing electric transmission and distribution systems, (ii) funding of feasibility studies and preliminary design work for new hydropower plants and backbone transmission line, (iii) demand side management and energy efficiency measures, and (iv) technical assistance and capacity-building for ESCOM and MoE. It focuses on putting in place a foundation for long-term economic growth through improved infrastructure and the investment climate, by helping close the supply-demand gap and improve the electricity distribution and transmission sector.

Of particular relevance to this project is Component #4 (Capacity Building & Technical Assistance Support to MoE-estimated at US\$2.9 million, including contingencies) which will provide specialized technical assistance, including studies, to accelerate the exploitation of renewable energy resources in Malawi. This component will support sectoral studies to underpin the evolving strategic agenda (energy policy and pricing, renewable energy development and regulatory issues, among others). This would, inter alia, cover technical assistance on measures necessary to strengthen the institutional, legislative, regulatory and safeguards frameworks for the development and operation of new hydropower plants in Malawi. It will also provide support for specialist IPP advisers to provide financial, legal and technical advice to GoM and MERA as it begins to solicit private sector investment in the power sector, particularly to assist with negotiations on Independent Power Producer (IPP) projects.

Sub-total: USD \$2.9 million (2012-2017)

Baseline #7 – Access to renewable energy for the rural areas of Malawi / COOPI and EU

This project (promoted by COOPI, the main organization for Italian international cooperation) and funded mainly by the EU aims at promoting the adoption and use of renewable energy by undertaking the training and awareness building of the communities where they will be used. All of this in pursuit of the objective of ensuring access to electricity to the highest number of people, slowing down the deforestation process, improving the quality of life of the people involved and promoting the development of small businesses that will profit from this resource. The activities contemplated by the project are:

- 1) Training and awareness building in the communities (approximately 8,000 people) as regards the construction and use of cost-efficient kitchens.
- 2) At the site of 6 dams, construction of 6 water towers, 6 meters high; setting up of 6 Committees entrusted with the management and maintenance thereof; supply of 6 energy solar pumps, water tanks and pipelines (as a loan); monitoring revenue increase, part of which will be used for maintenance (10%) and part for paying back the loan within 3 years. The loan restitution will be subsequently used to propose the same activities to another 6 communities in the same Kasungu district.
- 3) Supply of: 20 solar panels to other villages; 2 manual presses that will enable 20 communities to extract oil from jatrophia seeds; 5 motors run by clean fuel obtained from corn and other products for small local businesses; Training and planning as regards the management of timber resources from the surrounding forest; supply of 1,000 units of small solar panels (75 Wh) for domestic use as an incentive to the families involved so as to encourage the planting of new jatrophia trees and other local trees in a deforested 20 km area; supply of seeds, technical support, monitoring and planning of this reforestation.
- 4) (Likoma island) loan to be paid back within 3 years for 1 solar panel and 1 wind generator; training on the use and maintenance thereof. The energy supplied will be used for local business activities.
- 5) Supply of 5 large solar panels (2000 Wh) providing power to 5 schools; training of school administrators on fund raising for the maintenance of equipment and awareness building of the students regarding renewable energy.

Sub-total: The current amount of future funding for the project period could not be estimated at this time; it will be confirmed at the PPG phase

Baseline #8 – Renew’N’Able Malawi (RENAMA) and Development Aid from People to People (DAPP)

Renew’N’Able Malawi (RENAMA) is a non-governmental organization based in Malawi with a primary focus on renewable energy promotion in Malawi as well as enhancing coordination in the sector. RENAMA is one of the main NGOs involved in promoting decentralized energy solutions in the country and has extensive experience in promoting solar kiosk schemes in rural areas. They are a major sub-contractor for M-REAP work and the main support organization behind CONREMA.

DAPP is a Malawian managed NGO registered in 1996 under the Trustees Incorporation Act of Malawi. DAPP envisions a society in which communities are sustainable and have improved quality of life. DAPP has recently developed and submitted a Euro \$5 million dollar grant proposal (Energizing smallholder farmers to increase agricultural production) under the ACP-EU Energy Facility. The overall objective of the proposal is to improve access to modern energy services for improved livelihoods in Thyolo and Chiradzulu districts. The project aims to establish affordable electricity generated from small-scale hydropower stations and solar farms in the districts which can sustainably be used by rural smallholder farmers; promote the involvement of local energy players in identification, planning and implementation of energy interventions; and develop sound financial system that can support energy interventions. DAPP has extensive past experience with off-grid RE applications.

At present both these NGOs are developing new funding and operational plans and budgets for their RE activities over the project period and these will be confirmed at PPG phase.

Sub-total: TBD at PPG phase

Baseline #9 – World Future Council (WFC) activities in Malawi

The World Future Council Foundation is a registered charity in Hamburg, Germany with additional staff working in Geneva, London and Johannesburg. The World Future Council informs policy makers about future just policies and advises them on how to implement these. The World Future Council works in the field of Sustainable Ecosystems, Climate and Energy, Future Justice, Sustainable Economies, Peace and Disarmament.

In 2009 the WFC intensified its advocacy on renewable energy policies on the African continent and has worked to partner with UNDP Africa EITT staff in this regard. The organization believes there is an enormous opportunity for African countries to profoundly transform their societies and economies by upscaling the use of their renewable energy sources. This position stems from the result of a study for which the World Future Council and the Heinrich Böll Foundation have investigated and analyzed the existing and drafted Renewable Energy Feed-In Tariff policies of 13 African countries. On the basis of the study they have developed a handbook titled “Powering Africa through Feed-in tariffs. Accelerating renewable energy to meet the continent’s electricity needs”. A major outcome of the study is that the decentralized nature of electricity production within a REFiT provides the opportunity to empower communities and to revitalize local democracy and self-governance.

Enabling change legislation is the Word Future Council’s strength and mission. The WFC is committed to conduct further briefing sessions and workshops with policy makers, business stakeholders and civil society in African countries. The focus of their work is countries with a deficit of knowledge of renewable energy legislation and insufficient human capacity in all levels of administration to design and properly implement such policies. WFC is already actively working in Malawi and has proposed the following future activities to support RE roll-out (and this project) in Malawi:

- 1) WFC will serve as an objective (non technology biased/ no vested business or political interests) convener of a series of stakeholder engagement meetings on a national and local level in Malawi, showcasing good policy implementation in the field of energy access/ mini-grids.
- 2) WFC will conduct fact-finding missions to ensure successfully implemented supportive frameworks for mini-grids, and will look to share lessons learned from other countries for learning. WFC will work to closely guide and monitor the implementation of the lessons learned into an appropriate Malawian context.

It is estimated that 50% of the costs of these activities could be covered by the WFC budget with funds mobilized for

the remaining amount.

Sub-total: \$40K USD million estimate from WFC budget (2014/2015)

Total: USD \$10,222,000

In addition to the baseline activities mentioned above an inventory assessment of off-grid RE pilots conducted in April 2012 (funded under M-REAP) revealed the following baseline findings as regards the current status of off-grid decentralized RET schemes in the country:

- RE installations are spread all over Malawi's 28 administrative Districts.
- From current data, there seems to be a clustering of biogas projects in the Northern Region due to the historical bundling of experience on this technology in very few organizations, specifically the University of Mzuzu, and very limited scaling-up of installations since the first known Malawian biogas trials in the 1970s.
- With regard to solar photovoltaic sites, a large number of them seem to be sector-specific (especially health, education, agriculture) and are found either in schools and health centers where they have mostly been deployed in connection to governmental initiatives for lighting and basic electrification e.g. of vaccine fridges or in irrigation schemes. As such, solar installations are spread throughout the country.
- Solar PV as well as solar-thermal energy (water geysers) are used to a considerable extent in commercial settings and private households in Malawi.
- There are 6 known solar-wind hybrid sites spread over all three regions initiated by government as village electrification pilot projects.
- A handful of small-scale community-based wind electricity generation projects are so far known in the Northern Region around Mzuzu and in the Southern Region around Blantyre.
- The only micro-hydro site for a whole community is so far known to exist only in Mulanje (MEGA) while some smaller private initiative for household electrification were found in the North.
- Rather systematic and documented improved cook-stove projects are so far known in the central region in Balaka and Dedza, in the South in Mulanje, and in the North in Rumphi.

The proposed alternative scenario, with brief description of outcomes and components of the project / Incremental cost reasoning and expected contributions from the baseline, the GEF TF and co-financing

The proposed project addresses the key barriers mentioned (and those elaborated upon in the SE4A Rapid Assessment and Gap Analysis) in a way that specifically leverages and builds on the recent baseline initiatives mentioned. The project is embedded in the overall framework of UNDP's SEM project and includes the following three interrelated components:

Component 1 – Expansion of the Mulanje Electricity Generation Agency's (MEGA) micro-hydro power plant (MHPP) and mini-grid scheme

The expansion of MEGA offers a perfect ready-made opportunity for GEF funds to "incrementally" contribute to the scale-up and sustainable viability of Malawi's first IPP and most pioneering mini-grid operator. With assistance from DfID's Business Innovation Facility, MEGA has developed a business plan to expand to 10 sites in the district over the next 10 years, offering affordable clean energy to customers at tariff rates that will dramatically reduce costs to rural households while reducing emissions from fossil fuel alternatives. From its inception MEGA has been developed as a social enterprise, adopting the key social drivers of price minimization, site expansion and operating a financially sustainable business. As the first company of its kind in Malawi, MEGA made a deliberate decision at inception to target donor and community-based financing for its initial period of growth, funding both operational costs and capital

expenditures (their business plan estimates that from the opening of the 6th site, economies of scale will have been captured and it will be able to finance operational costs from its own retained reserves).

At present MEGA has one site (Lower Bondo (88 kWp) fully operational and two under construction - (Upper Bondo (60 kWp) and Sathawa (60 kWp) and developed EPC cost estimates for seven other sites in its business plan. Operational overheads are currently covered through year 2014/2015 by existing donor commitments from OFID, Practical Action, DFID BIF and USAID. In a response to barriers #1 and #2 and recognizing that MEGA's success is critical not only for its customer base in Mulanje District but also in establishing the success of such schemes across the country, under this component GEF funding (both TA and INV) will be used to increase the installed capacity of MEGA's MHPP scheme to 288 kWp by the end of Year 3 of the project. As regards INV, GEF funds will be used for two capital grants (US\$150K each) for Lililezi (40 kWp) and Fort Lister (40 kWp) MHPPs – this contribution represents approximately 54% of their current EPC capital budget (GEF funds will be used for completion of feasibility studies, technical designs, EIAs, licenses, etc as well as hardware costs). Donor funds from OFID, Practical Action, DFID BIF and other potential future funding partners will be used to match the GEF contribution.

TA funds will combine with INV to support a variety of related institutional and capacity-building activities in the two new sites including the following activities:

- Engineering supervision and quality assurance of construction and installation for the two sites;
- Capacity building for MEGA and project partners; mentoring, trainings, guides and toolkit development;
- Carrying out energy access, efficiency and utilization campaigns at community and district levels;
- Implementation of an innovative pre-payment electricity system for households connected to MEGA in communities (following the Bondo model);
- Collaboration with the relevant regulatory authorities for issuance and approval of required generation and distribution licences;
- Training of community members on operation and maintenance of the schemes;
- Facilitation of increased access to energy services in the community; helping realize benefits of lighting, cooking, access to ICTs, and community enterprises in the community through improved energy technologies, creating new jobs, increasing profits, and offering new products and services to the local people. Improvement of public services in the community through enhancing energy-related facilities and services in the village health centers and schools serviced by the schemes.
- Facilitation of policy workshops promoting decentralized energy access models using MEGA case studies.
- Showcasing and disseminating information on the MEGA scheme as a “national case study” for community-based mini-grid development in Malawi (MEGA's history and model will be showcased via funding for a short video and other promotional materials)

Component 2 – Replication of MEGA model via piloting of two (2) mini-grid schemes in either the Karonga and Chitipa districts (Northern Region)

Following a similar model as Component #1, this component will seek to replicate the basic MEGA model (vertically integrated mini-grid scheme operated as a social enterprise) in the Northern region of the country. Building on district level capacity-building supported by Output 1 of UNDP Sustainable Energy Management Support to Malawi PSD, it will specifically seek to facilitate investment in at least 80 kWp of sustainable mini-grid scheme(s).

The design and choice of technologies for the mini-grid scheme(s) will be decided during the PPG phase but it is expected that it will either be a micro-hydro scheme or either a solar/wind hybrid or solar/diesel

hybrid²⁹. As noted earlier, the National Water Resources Master Plan for Malawi prepared by the Government of Malawi with the assistance of the UNDP identified many potential sites for the development of mini- and micro- hydro power schemes. A total of 12 potential sites have been identified in the Northern Region and all of them are within Karonga and Chitipa districts. Studies conducted in 2002 by JICA for the Malawi Rural Electrification Plan (MAREP) also identified additional potential sites suitable for mini hydro power plants and they are now doing an updated assessment of the country's hydro power generation potential (see a list of 12 promising MHPP sites in Table 2 and further details in Annex I). At the same time with decreasing PV prices, solar/wind hybrid mini-grids are attracting significant attention to mitigate fuel price increases, deliver operating cost reductions, and offer higher service quality than traditional single-source generation systems. The combining of technologies provides interesting opportunities to overcome certain technical limitations

Table 2 - Cost Estimate of Promising MHPP Sites in Northern Region (JICA, 2002)

Cost estimate result of the promising potential sites				
District	T/C	Site	Output (kW)	Amount (US\$)
Chitipa	Chisenga	Chisenga	15	433,610
Chitipa	Mulembe	Kakasu	15	487,140
Chitipa	Nthalire	Choyoti	60	896,580
Rumphi	Katowo	Hewe	45	641,090
Rumphi	Nchenachena	Nchenachena	30	476,890
Nkhatabay	Khondowe	Murwezi	5	299,890
Nkhatabay	Ruarwe	Lizunkhuni	50	631,460
Nkhatabay	Usisya	Sasasa	20	493,150
Mangochi	Kwisimba	Ngapani	5	473,450
Mangochi	Katema	Mtemankhokwe	25	392,200
Thyolo	Sandama	Nswadzi	75	1,213,930

TA activities under this component will include:

- Conducting basic pre-feasibility assessments, EIAs and load forecasts for the two selected mini-grids at the sites in targeted districts;
- Sensitization campaign conducted with district councils and community groups in targeted areas (following the MEGA model);
- Legal establishment of a independent mini-grid operator in the targeted districts with approved generation/ transmission licenses, governance structure, tariff policy and investment plan;
- Construction and commissioning of two MHPP or solar/wind hybrid schemes (at least 80 kWp total installed capacity);
- Support for implementation of an innovative pre-payment electricity system for households connected to the schemes (following the MEGA model);
- Capacity building for and project partners; mentoring, trainings, guides and toolkit development; and
- Development of sustainable O&M&M models for all mini-grid schemes

²⁹ If a solar/diesel scheme is selected no GEF funds will be used to fund the fossil-fuel based component.

Similar to Component #1, GEF funds will include a combination of TA and INV. Initially GEF-funded TA will be used for the capacity-building activities, community sensitization campaigns and feasibility studies that will inform the development of the chosen mini-grid site(s). GEF INV funds in the form of two capital grants (US\$150K each) will then be released to the relevant authorities to cover a certain percentage of the capital costs of the green field sites upon completion of certain pre-determined milestones, namely: 1) the required generation/transmission licenses have been issued; 2) the remaining non-GEF financing costs have been mobilized (that is expected to come from donors such as BIF and district government budgets, as well as other sources); 3) the IPP(s) has been incorporated as a PPP or limited liability company; and 4) the appropriate governance structure, tariff policy and investment plan is in place (validated by an independent third party).

The exact governance structure will be further analyzed during the PPG phase in consultation with the relevant district and community authorities and based on an assessment of the institutional capacities in the targeted districts. In an effort to address barrier #2, this component will pay particular attention to ensuring community sensitization (prior to implementation) on the need for cost-reflective tariffs and a robust collection scheme, as well as community participation in on-going operations and maintenance of the mini-grid(s).

Component 3 – Institutional strengthening and capacity building for promotion of decentralized, mini-grid applications across the country

In parallel to the site-specific activities under Components 1 and 2, the third component will focus on increasing the capacity of government, private sector and community stakeholders to develop and plan decentralized energy projects across the country in a systematic fashion. Activities under this component will focus on addressing the challenges mentioned under barrier #3 and include:

- Establishment of a national clearinghouse mechanism for mini-grid developers and investors established;
- Training for both developers and community stakeholders on basic RE/hybrid mini-grid cost-benefit analysis;
- Support for dissemination of REN21Africa Mini-grid toolkit;
- Support for identified needs that are not covered under M-REAP's Renewable Energy Capacity Building Programme (RECBP) as regards rural mini-grids (gaps or needs for potential GEF funding to be determined at the PPG phase)
- Support for any identified capacity-building or institutional strengthening needs of the newly formed *Cooperation Network for Renewable Energy in Malawi* (CONREMA) (gaps for potential GEF funding to be determined at the PPG phase)
- Support to 14 District Executive Committees (DEC) to establish and operationalize district, area and village plans for decentralized clean energy applications with accompanying information sharing platforms in place (in conjunction with SEM)

This Component will be closely integrated with the other two components as regards working with district level authorities but will include stakeholders from all 14 vulnerable districts targeted in the UNDP SEM PSD whereas Components #1 and #2 will work more specifically with the district stakeholders in the targeted three districts that will have mini-grid plants. This component will be the most broad-based and will include in-depth collaboration with all partners of the *Cooperation Network for Renewable Energy in Malawi* and a variety of donor organizations in the energy sector.

A summary of the business-as-usual (BAU) scenario, incremental activities funded by GEF, and linkages to baseline investments is provided below in Table 3, disaggregated by Component.

Table 3: Project Activities and Incremental Reasoning

BAU Scenario	Incremental Activities (GEF Project Components)	Incremental Reasoning vis-à-vis baseline
Component 1: Expansion of the Mulanje Electricity Generation Agency's (MEGA) micro-hydro power plant (MHPP) and mini-grid scheme		
<p>- At present MEGA has one site (Lower Bondo (88 kWp) fully operational and two under construction - (Upper Bondo (60 kWp) and Sathawa (60 kWp) out of total of 10 sites planned</p> <p>- No capex funding is available from commercial sources for full MEGA roll-out</p> <p>- MEGA business plan in place but does not yet have minimum number of operational sites (economies of scale) to generate revenues to be self-sufficient over long-term</p> <p>- National and regional awareness of the MEGA model and scheme for community-based mini-grid development is very limited</p>	<ul style="list-style-type: none"> • Construction and commissioning of Lilulezi (40 kWp) and Fort Lister (40 kWp) MHPPs to add to existing plants operated by MEGA • MEGA successfully meeting its tariff pricing, supply efficiency and financial targets (as codified in its business plan) for all sites by end of project • MEGA established as a viable social enterprise, enabling further growth and meeting its targets to operate on a stand-alone basis going forward • MEGA's model is showcased and disseminated as a "national case study" for community-based mini-grid development in Malawi leading to replication of MEGA model 	<p>GEF funding under Component #1 will incrementally build off baseline investments from MEGA and its partners, particularly Practical Action (baseline project #1); the national government (baseline project #2); Mulanje District Council (baseline project #2); Business Innovation Facility - Malawi /DFiD – Phase II (baseline project #5) and UNDP Malawi's Sustainable Energy Management Support to Malawi Project (SEM - See Section B.3).</p>
Component 2: Replication of MEGA model via piloting of two (2) mini-grid schemes in either the Karonga and Chitipa districts (Northern Region)		
<p>- Studies have indicated that Malawi has an SHPP potential of 7.35 MW from 22 sites and identified a further 345 kWp of micro-hydro potential, mostly located in the Northern Region of the country bordering Tanzania – however almost a fraction of this is utilized</p> <p>- At present the only mini-grid sites in the North are two DoE-funded stand-alone 20.1 kWp village solar-wind hybrid stations and mini-grids (which are in a poor state of repair) and a handful of small-scale community-based wind electricity generation projects in the region around Mzuzu</p> <p>- There are no independent power producers operating mini-grids in the northern region</p> <p>- Community sensitizations on</p>	<ul style="list-style-type: none"> • Basic pre-feasibility assessments and load forecasts done for mini-grids at two sites in targeted districts • Sensitization campaign conducted with district councils and community groups in targeted areas • Legal establishment of independent mini-grid operator in one of two targeted districts with approved generation/transmission licenses, governance structure, tariff policy and investment plan • Construction and commissioning of two MHPP or solar/wind hybrid schemes (at least 80 kWp total installed capacity) • Sustainable O&M&M models demonstrated for all mini-grid schemes 	<p>GEF funding under Component #2 will incrementally build off baseline investments from the Ministry of Energy and MERA (baseline project #2); Karonga and Chitipa District Councils and authorities (baseline project #2); JICA (baseline project #3); M-REAP (baseline project #4); Business Innovation Facility - Malawi /DFiD – Phase II (baseline project #5); the World Bank (baseline project #6); and UNDP Malawi's Private Sector Development and Sustainable Energy Management (SEM) Support projects (See Section B.3).</p>

the benefits of mini-grids, cost-reflective tariff schemes (the need to pay for electricity) and proper O&M&M practices (such as that done by MEGA) are almost non-existent in the region		
Component 3: 3. Institutional strengthening and capacity building for promotion of decentralized , mini-grid applications across the country		
<ul style="list-style-type: none"> - M-REAP has developed a community renewables toolkit but it is not specific to mini-grids - No national clearinghouse exists for interested mini-grid developers and information is not systematically collected and disseminated - The level of awareness of policymakers and community stakeholders on mini-grid development is extremely low - The REN 21 mini-grid tool kit has been completed but is not disseminated in Malawi -UNDP's SEM project (see B.3) has an output on "Sustainable Energy Management mainstreamed in policies and development plans at national and district level" but needs funding to support District Executive Committees (DEC) developed plans for decentralized clean energy applications 	<ul style="list-style-type: none"> • National clearinghouse mechanism for mini-grid developers and investors established • Training for both developers and community stakeholders on basic RE/hybrid mini-grid cost-benefit analysis • Support for dissemination of REN21Africa Mini-grid toolkit • Support to 14 District Executive Committees (DEC) to establish and operationalize district plans for decentralized clean energy applications with accompanying information sharing platforms in place 	<p>GEF funding under Component #3 will incrementally build off baseline investments from the Ministry of Energy, Ministry of Environment and Climate Change Management and MERA (baseline project #2); District Council authorities (baseline project #2); JICA (baseline project #3); M-REAP (baseline project #4); Business Innovation Facility - Malawi /DFiD – Phase II (baseline project #5); the World Bank (baseline project #6); and UNDP Malawi's Private Sector Development and Sustainable Energy Management Support to Malawi projects (See Section B.3).</p>

Global Environmental Benefits

The proposed project activities have been selected as the most cost-effective incremental investments to successfully achieve the intended GEBs in light of the country's capacity constraints, SE4A targets and institutional context. Most if not all of the GEF-funded activities build off significant investments already incurred by other partners; for example under Component #1 over US \$1.5 million has already been invested in MEGA to date by USAID, OFID, the European Commission and DFiD (baseline co-finance pledges do not count that an include only new commitments). A detailed study on "Return on Donor Investment" done as part of the original MEGA business plan indicated that for the 10 site scheme, a net present value of over USD 12.5 million will be saved by rural household beneficiaries as regards energy

expenditures (compared to a BAU scenario) for a total donor investment of USD 3.5 million. This directly measurable return does not count other intangible impacts on the region that a reliable source of energy will bring (for example economic activities from productive energy use) and associated health benefits for beneficiaries.

As mentioned in Section A.1 MHPP schemes have been shown to be among the most cost-effective options for rural electrification purposes in a Malawian context. Although the energy provided by MEGA is priced at a premium to ESCOM (which is itself not cost-reflective at present), studies have shown that the current MEGA tariff is 17 times cheaper than the cost of fossil-fuel based energy paid by the customer in the rural economy under a BAU scenario and thus offers an excellent value proposition to rural households. More generally experience has proven from studies across Africa that in a rural electrification context it is possible to get a very decent price per kWh for a hydropower system if there is limited civil works and relatively small distance to end users/limited wiring. Practical Action has done extensive work on promoting MHPPs in Africa in a cost-effective manner and will work to ensure as high a high plant factor as possible for the targeted schemes. The following techniques/measures³⁰ will also be considered for the installation of MHPPs under Components #1 and #2 (if applicable) to ensure the capital costs of the MHPP are as low as possible (where applicable these same measures have already been put in place by Practical Action for the MHPPs already established):

- use of locally manufactured equipment where possible and appropriate (in the case of Bondo MHPP the Pelton turbine jet was sourced from Zimbabwe)
- use of HDPE (plastic) penstocks where appropriate
- use of an electronic load controller (allows the power plant to be left unattended, thereby reducing labor costs and introduces useful by-products such as battery charging or water heating as dump loads for surplus power; also does away with bulky and expensive mechanical control gear)
- using existing infrastructure, for example, a canal which serves an irrigation scheme (if applicable)
- using pumps as turbines (PAT)
- pre-fabricated wiring systems
- using motors as generators
- use of community labor
- good planning for a high plant factor and well-balanced load pattern
- use of self-cleaning intake screens

As regards reducing CO₂ emissions, these can only be estimated at this time since we do not have all the data required for detailed calculations. In the near-term the proposed mini-grid electricity will replace fossil fuel consumption such as kerosene burning for lighting at the household level and use of diesel for on-site batteries recharging and power supply to SMEs and community facilities (such as medical clinics). Emission reduction calculations in Malawi are complicated by the high level of suppressed demand and lack of energy data as well as the fact that for 80% of the people living in rural areas, access to electricity is less than 1%, among the lowest electrification rates in the world.

For example in the case of MEGA's first SHPP, Bondo, the current average BAU energy consumption of a connected household is estimated approximately 243 kWh per year. A preliminary study done as part of the MEGA business plan estimates that at that BAU level the proposed MEGA MHPPs will result in more than 100,000 liters of saved kerosene usage per year for residential household beneficiaries; however these are only 59% of the estimated customer base. In the case of Bondo the MHPP is now connected to three mills which together consumed some 133,650 kWh per year, mostly from diesel (before they were connected to Bondo). Therefore one can see the huge variation depending on customers and the ER calculations must consider the two types of fuel switch depending on the customer base.

³⁰ Technical Brief, Micro-hydro Power, Practical Action

The MEGA model also leaves flexible whether grid inter-connections offer a feasible opportunity for future sites, depending on many factors such as consideration of complementary base loads and the impact of line losses. Malawi is currently looking at developing its coal reserves for on-grid generation and in the short-term connecting to the Southern Africa Power Pool. The grid emission factor for the South Africa Power Pool is .9588 (t CO₂ / MWh). If one were to apply that factor that to the approximately 3 million kWh envisioned to be produced from the 10 MEGA SHPPs, using the standard GEF assumptions the emission reductions from the hydro sites would be in the order of 43,377 tCO₂e over 15 years and applying a causality factor of 3 the indirect benefits would be 130,311 tCO₂e (an abatement cost in GEF\$/ton CO₂e of USD \$13).

The major emission reduction benefits from this project are expected to be from the replication potential. While the actual direct ex-ante emission reductions from the targeted schemes may be fairly low (given the low energy usage per capita among households and businesses) the replication potential of the GEF investments is huge if these pilot projects are successful. As already mentioned, the JICA-funded study in 2002 indicated that Malawi has an SHPP potential of 7.35 MW from 22 sites and identified a further 345 kWp of micro-hydro potential. It can be expected that if GEF support can assist in establishing the viability of mini-grid models the potential for replication and scale-up across the country is enormous, and offers a strong counterweight argument to exploiting coal reserves. Detailed baseline analyses of current usage and fuel switch for each of selected pilot locations and estimation of ex-ante direct and indirect GHG emission reduction will be conducted at PPG stage and presented in the Request for CEO Approval.

Innovativeness, sustainability and potential for scaling up

The activities proposed under this project are extremely cutting-edge and innovative for a Malawian context, offering tremendous promise for replication and scale-up across Malawi. The MEGA social enterprise model – while based on initial donor subsidies – has been subject to rigorous financial analysis (funded by BIF and validated by external consultants) and development of a sustainability plan. The MEGA community sensitization/ownership structure and tariff-setting model (which will be adopted for all sites under Components #1 and #2) – as well as use of “smart” donor subsidies – ensures long-term ownership and sustainability. Moreover the use of pre-paid meters ensures accountability as regards customer payment for energy consumed. The contribution and partnership of actors with rigorous financial and social sustainability due diligence processes and commitments to market-based approaches – such as BIF and Practical Action – will ensure that long-term sustainability is a central concern in all aspects project design. Moreover the collaboration with regional organizations such as REN21 and harmonization of project activities with their new mini-grid toolkit will ensure that best practices are mainstreamed through the project. MEGA will continue using its models in its business operations after the GEF project implementation period is over. It is envisioned that the outputs or outcomes of this project will be duplicated or enlarged in a larger scope, or in other sectors, or in other areas in the country

A.2. Stakeholders. Identify key stakeholders (including civil society organizations, indigenous people, gender groups, and others as relevant) and describe how they will be engaged in project preparation:

Overall the project will be coordinated by the Ministry of Energy – Department of Energy Affairs (DEA), whose mandate is to “*fully satisfy the public need for quality modern energy services by effectively governing and facilitating the development of a robust, sustainable and efficient private sector-driven energy industry.*” However while there is a well-established institutional structure to handle energy affairs at national level, at the district level such structures are missing e.g. there is no DEA presence at the district or community level. Most of the downstream decentralized energy platforms in the country are implemented by NGOs, public/private partnerships or social enterprises with government entities only providing limited regulatory oversight. Moreover at present there is no comprehensive coordination mechanism for energy sector programs in the country. These facts are specifically noted in the SEM Project (see Section B.3) under which this project is embedded. Under Output 4 of the UNDP SEM project (See

Section B.3) a PMU will be set up embedded in the DEA; in order to ensure collaboration with that project – the main source of direct support for DEA in the country – the PM for this project will be located in the same structure. All implementation and M&E of this project will be done jointly as part of SEM activities, which are in turn closely linked to the other UNDP CC, ENR and DRM programs (this is important under the UN Delivery as One approach).

Given government constraints, a high level of non-governmental stakeholder involvement in the project is critical and expected to be significant, particularly as regards implementation of decentralized site-level activities under Components #1 and #2. In the case of Component #1, it is likely that Practical Action (given that they are main partner in MEGA and already have project staff embedded within MEGA) or district authorities will be given legal authority for executing project activities (in the former case under a NGO-execution modality) and MoU with DEA (a detailed analysis of project management arrangements will be done during the PPG phase). Under Component #2 a similar arrangement may be undertaken either the relevant district councils or NGOs (Practical Action, RENAMA or DAPP), or some type of PPP special purpose vehicle will be established during the PPG phase to execute activities in line with GEF guidelines. DEA will have lead authority for Component #3 but again can be expected to work in close collaboration with district partners, UNDP's SEM and new structure such as COREMA. All project activities will also be closely integrated with UNDP's SEM project and SE4A framework at the national level. A summary overview of the roles and responsibilities of major project stakeholders is provided in Table 4:

Table 4. Summary Overview of Stakeholder Roles and Responsibilities

Stakeholder	Role in Project
Ministry of Energy - Department of Energy Affairs	Overall lead coordinator – executing agency for Component #3
Ministry of Environment and Climate Change Management	Collaborative partner for all components, particularly as regards M&E and integration of relevant climate information into energy planning activities under Components #1 and #2.
Malawi Energy Regulatory Authority (MERA)	Key partner for MHPP-based activities (issuance of licenses) under Components #1 and #2 and regulatory/enabling activities under Component #3
Selected District Councils (Districts of Mulanje, Karonga and/or Chitipa) and District Executive Committees (DEC)	Key executing partner under all activities; in the case of Components #1 and #2 the relevant district councils could be delegated execution authority at the discretion of DEA
World Bank	Collaborator as regards collective efforts to strengthen the institutional, legislative, regulatory and safeguards frameworks for the development and operation of new hydropower plants in Malawi via Component #3
Malawi Renewable Energy Acceleration Program (M-REAP) / Government of Scotland	Key collaborator, particularly under #3 and possibly in site-level activities under other Components (to be determined at PPG phase)
Business Innovation Facility - Malawi /DFiD	Key collaborator under all Components;
Japanese International Cooperation Agency (JICA)	Key collaborator for Components #2 and #3; studies done by JICA (for the updated RE master plan) will be important for selection of schemes under Component #2
Mulanje Electricity Generation Agency (MEGA)	Key partner for Component #1 and advisory support for other Components
Practical Action	Likely to be delegated authority for lead execution of Component #1 or involved as a sub-contractor – their exact

	role will be determined at PPG phase; advisory support for all other project activities; PA will likely be asked to sit on the PSC
Renew'N'Able Malawi (RENAMA)	Key partner and likely sub-contractor under Components #2 and #3; CONREMA will be a key partner for Component #3; RENAMA will likely be asked to sit on the PSC
Development Aid from People to People (DAPP) Malawi	Key partner and collaborator under all Components
World Future Council	Key collaborator under Component #3; will share lessons learned and provide advisory assistance based on regional work
EUEI-PDF and REN21	Key collaborator for Component #3

The project is expected to have a significant positive impact on gender empowerment. In Malawi women have often been considered unequal to men due to their traditional roles, household responsibilities and low social and political status. This is especially pertinent around household energy. Gender based responsibilities and cultural practices often mean that women and girls do not have access and control over resources and technologies. Women and children are disproportionately affected by indoor air pollution resulting from cooking fires or fossil-fuel combustion. Collecting firewood, processing and threshing and husking or grinding of the traditional food is highly gender-influenced, and still mainly a woman's task. Due to the low literacy levels and low economic status, women may not have access to improved energy sources and when they do they often spend a disproportionate amount of disposable income on sub-optimal energy platforms. Moreover with the advent of the mini-grids rural health clinics (one of the chief beneficiaries of the MHPPs) are now able to store medicine and operate more effectively with access to electricity which is of major benefit to women.

During the design of this project, innovative approaches targeting the promotion of renewable technologies among women will be piloted in the target districts. Some energy saving activities have already been demonstrated and introduced in Malawi (targeting women groups in some instances) but the scaling-up of new, effective and gender sensitive energy innovations has been lacking. Gender is one of the most important cross-cutting issues incorporated into both MEGA's business and operational model and UNDP's SEM project (see Section B.3). The impact of project activities and beneficiaries will be disaggregated by gender during the PPG phase.

A.3 Risk. Indicate risks, including climate change, potential social and environmental risks that might prevent the project objectives from being achieved, and, if possible, propose measures that address these risks to be further developed during the project design (table format acceptable):

Risk	Rating	Mitigation
Malawi's unimodal rainfall pattern is characterised by high spatial and temporal variability. According to Global Circulation Models (GCMs) and Regional Climate Models (RCMs), the predicted effects of climate change (CC) are expected to exacerbate this situation, with some areas expected to get higher rainfall while others will become drier. Furthermore, the projected temperature increase of 1.1 to 3.0°C by the 2060s and 1.5 to 5.0°C by the 2090s will worsen the effects in areas receiving low	M	<p>This risk is caused by both localized and external factors (i.e. climate change) but in the short-term to the extent possible will be mitigated by using climate modeling data from the UNDP/GEF LDCF Project - <i>Strengthening climate information and early warning systems in Africa for climate resilient development and adaptation to climate change – Malawi</i>. Hydro sites will not be selected in watersheds which are deemed to have inordinate exposure to reduced water flows from drought and all projects will have EIAs. The project will benefit from a new USAID vulnerability assessment report due out soon.</p> <p>The project is expected to have limited impacts on the social and natural environment in view of the small areas that will be covered by these projects and the fact that for MHPPs they are run-of-the-river. The JICA 2002 RE Mater plan confirmed the limited</p>

rainfall due to higher potential evapotranspiration. The water flow level of rivers and watersheds may be reduced due to a prolonged dry season exacerbated by climate change. Prolonged dry seasons are becoming more regular due to accelerated deforestation.		<p>environmental impacts of MHPPs as follows</p> <p>(a) Fauna and Flora -- the majority of the potential sites for the proposed Hydro-power plants are in Karonga and Chitipa districts in the Northern Region with only one in Mulanje in the Southern Region. There will be little clearance of vegetation related to the installation of the power plants and any special ecological niches existing in the affected catchments will be identified during the preparation of the Environmental Impact Assessment report. Appropriate mitigation measures will be taken to protect them. During the preparation of the EIA, particular attention shall be given to ensure that sedimentation, downstream flows, water usage and quality and their effect on flora, fauna and the people are adequately investigated.</p> <p>(b) Land Use – only a few settlements will be affected by these developments. There are a few agricultural activities in the catchments in which the Hydro-power plants are located. Consequently, limited compensation and resettlements will be required. Details will be identified as part of the ESIA process.</p> <p>(c) Construction work impact-minimum land clearing is anticipated at all project sites and any negative environmental impacts resulting from the construction activities will be addressed during the production of the EIA.</p>
The new UNDP Malawi Project Support Document: Sustainable Energy Management Support to Malawi (See Section B.3) identifies lack of technical capacity at the district level as among the main institutional barriers inhibiting RE planning and roll-out. That project document notes that <i>“that the link between national planning and district implementation is constrained by lack of both human and financial resources. In addition, formal communication structures are undefined, weak and in some cases non-existent. Weak interaction with and involvement of the private sector and local entrepreneurs in the execution of policies also indicate significant gaps preventing the effective uptake of national initiatives for renewable energy and energy efficiency.”</i>	H/M	This risk has been specifically dealt with in project design by engaging with the most capable stakeholders on the ground in the targeted districts (social enterprises, NGOs, etc) and ensuring that they are given a significant role in project implementation. Significant funds are allocated to TA both at the district and national level and the project’s integration with SEM, M-REAP and CONREMA structures will ensure that all stakeholders are working together and maximizing synergies. While noting that the proposed schemes and decentralized governance structures are cutting edge for a country with such chronic poverty, the risks of piloting such schemes outweighs potential risks.
Lesson learned from many of the government-funded, village solar-wind hybrid stations and mini-grids is that there was not sufficient attention paid to community sensitization on the need for community members to pay for the energy provided and identify the structures to collect tariffs for	H	This issue has been expressly addressed via project design. The specific choice of using the MEGA model was made because of their success in developing successful community-based payment and O&M schemes. Community sensitization on the need for payment of electricity provided and adequate attention to O&M are priority activities and in case of Component #2 GEF funds will only be released once appropriate arrangements are in place to ensure payment-for-services by beneficiaries.

ongoing operations and maintenance of the mini-grids. The BARREM final evaluation report which noted that a large numbers of government and donor-funded RE installations are now non-operative despite having showed high demand for energy services; this is mainly due lack of sustainable operational models and proper maintenance (this was also highlighted in a recent report by M-REAP).		
There are technology risks related to the introduced technologies, in particular the mini hydro technologies and their operation. Although the project will be establishing proven technologies, there might still be risks involved with the components.	H	The project intends to utilize proven, feasible and affordable technologies and duplicate solutions that have been successfully introduced in both Malawi and several countries in the region. The project benefits from involvement of entities such as Practical Action, RENAMA and REN21 that have extensive experience with hands-on technology transfer in Malawi and/or documentation of the requisite conditions for successful RE mini-grid adoption in an African context (REN21).

The Project's Overall Risk Level is High/Medium. A full assessment and mitigation strategy of all project risks will be done at the PPG phase.

A.4. Coordination. Outline the coordination with other relevant GEF financed and other initiatives:

The proposed project will avoid duplication and seek to find synergy with other ongoing projects and programs, particularly the initiatives listed below which are not included as baseline activities but nonetheless have strong linkages with the proposed project activities. Collaboration will be done via communications with the responsible entities mentioned below and the entities will be invited to participate in stakeholder consultation meetings and be consulted as regards project design during the PPG phase.

- African Development Bank (AfDB) / Kholombidzo Hydroelectric Power Plant (HPP) feasibility study. The African Development Bank (AfDB) Group approved in March 2013 a grant amounting to US \$3.04 million to finance the Kholombidzo Hydroelectric Power Plant (HPP) Feasibility Studies in Malawi. The Government of Malawi will contribute US \$0.23 million (7%) of the total study cost of US \$3.27 million. The grant aims to produce a full bankable feasibility study for the future development of a power generation project to contribute to the expansion of electricity generating capacity in Malawi, which would ultimately help to address electricity shortages and enable the delivery of reliable energy and electricity access expansion in Malawi.
- UNDP/GEF LDCF Project - *Strengthening climate information and early warning systems in Africa for climate resilient development and adaptation to climate change – Malawi*. This new LDCF project is focused on strengthening the capacity of national and sub-national entities to monitor climate change, generate reliable hydro-meteorological information (including forecasts) and combine this information with other environmental and socio-economic data to improve evidence-based decision-making for early warning and adaptation responses as well as planning for energy and water use. The project will interact with this project as regards accessing the micro-scale climate information needed to assess any weather, climate and hydrological risks from the chosen mini-grid sites. This is part of the DRM program.
- The *Enhancing Community Resilience Project* (ECRP, 2011-2015) – funded largely by the British Department for International Development (DFID) is focusing on developing flood and drought early warning systems with a focus on mitigation and risk reduction initiatives in 11 vulnerable

districts including Nsanje, Dedza, Salima, Karonga, Balaka, Chikhwawa, Kasungu, Machinga, Mulanje, Mwanza, Nsanje, and Thyolo.

- UNDP *Programme Support to National Climate Change Programme* (NCCP), 2013-2016, ~\$14 million) will support the Government of Malawi to climate-proof the policies, strategies and plans of the sectors of the economy most directly affected by climate change, in order to create an enabling policy and regulatory environment within which vulnerable communities will be empowered to adapt to these challenges in harmony with the environment. Key in achieving these results is to strengthen the capacity of the relevant institutions, e.g. the new Ministry of Environment and Climate Change Management, and other stakeholders, specifically around planning, coordination and implementation of effective climate change adaptation and mitigation efforts, including the foreseen establishment of a Sector Wide Approach (SWAp). An important element is to ensure increased financing to mitigate and adapt to climate change through the production of the National Climate Change Investment Plan, and the establishment and operationalization of implementation modalities and financing mechanisms of this investment plan at national and district levels. This project will work to assist Malawi to secure financial support for adaptation and mitigation from the various emerging markets / funds, while providing advice to assist the country to move towards a low carbon growth path.
- Malawi's US \$350.7 million compact with the US Government's Millennium Challenge Corporation compact is a single-sector program designed to increase incomes and reduce poverty by revitalizing Malawi's power sector and improving the availability, reliability and quality of the power supply. Signed in 2011, the compact's Power Sector Revitalization Project seeks to increase the capacity and stability of the national electricity grid and bolster the efficiency and sustainability of hydropower generation. The Power Sector Revitalization Project is comprised of two activities, the Infrastructure Development Activity and the Power Sector Reform Activity. The Infrastructure Development Activity focuses on the most urgent rehabilitation, upgrade and modernization needs of the power system. The activity will preserve and stabilize existing generation capacity, improve capacity of the transmission and distribution network and increase the efficiency and sustainability of hydropower generation. The Infrastructure Development Activity also includes a sub-activity addressing environmental and social factors that negatively impact Malawi's hydropower plants. The Power Sector Reform Activity complements the Infrastructure Development Activity by providing support for the Government of Malawi's policy reform agenda and by building capacity in critical sector institutions. The activity will build capacity and provide technical assistance to the Electricity Supply Corporation of Malawi (ESCOM), MERA and the Ministry of Natural Resources, Energy and the Environment.
- The World Bank-funded *Shire River Basin Management Program Phase 1* Project (SRBMP, 2012-2018, ~\$125 million) aims to establish coordinated inter-sectoral development planning and coordination mechanisms, undertake the most urgent water related infrastructure investments, prepare additional infrastructure investments, and develop up-scalable systems and methods to rehabilitate sub-catchments and protect existing natural forests, wetlands and biodiversity in the Shire River Basin. The project will be providing irrigation and flood management infrastructure in the Shire River basin, as well as training and infrastructure for the hydro-meteorological services – this includes the installation of considerable ground- and surface-water measuring equipment in the Shire River Basin in order to provide real-time information to a control centre within the Department of Water Resources.
- The project will also seek to build off lessons learned from the GEF-funded *Barrier Removal to Renewable Energy in Malawi (BARREM)* project which facilitated establishment of test and training facilities at Mzuzu University, training of engineers and technicians, and promotion of solar systems in rural clinics, schools and homes.

On a regional level the project will also seek close collaboration with two ongoing projects that are specifically supporting national actors in the SADC region on development of mini-grids:

- EUEI-PDF Project - Regional Electricity Association of Southern Africa (RERA) Policy Options for the Planning, Development and Regulation of Mini-Grids employing renewable and hybrid generation. The Regional Electricity Regulators Association of Southern Africa (RERA) with support from the SADC Secretariat requested technical assistance from the RECP to develop supportive framework conditions for mini-grids employing renewable and hybrid generation in Southern Africa. The purpose of the project is to encourage development of supportive policies to enhance the framework conditions for mini-grids based on renewable or hybrid systems among SADC members. Such policies will facilitate investment by public and private actors in mini-grids in the SADC region. The development of mini-grids, in turn, will contribute to access to energy in the SADC region. This support is being provided through a project which started in January 2013. The project is implemented in collaboration with the Regional Electricity Regulators Association of Southern Africa (RERA) with support from EUEI PDF under the Africa-EU Renewable Energy Cooperation Programme (RECP), which is funded by the European Commission and some EU member states.
- EUEI PDF, executing the RECP, is currently implementing a project to develop and disseminate an Africa "Mini-Grid Policy Toolkit" with REN21 and the Alliance for Rural Electrification (ARE). The Toolkit will target at policy-level decision-makers and senior technical staff in African countries towards supporting them in shaping up the policy and regulatory framework for rural electrification through renewable energy or hybrid mini-grids. The project is ongoing and is planned to finish at the end of 2013.

B. Description of the consistency of the project with

B.1 National strategies and plans or reports and assessments under relevant conventions, if applicable, i.e. NAPAS, NAPs, NBSAPs, national communications, TNAs, NCSAs, NIPs, PRSPs, NPFE, Biennial Update Reports, etc.:

This project is informed by and supportive of all of the relevant national energy and climate change policies as described in detail below:

- Vision 2020 (2000) is the overall policy framework for Malawi's development that was adopted in 2000 and will be used until 2020. The ambition of Vision 2020 is for Malawi to be "*secure, democratically mature, environmentally sustainable and self-reliant with equal opportunities for and active participation by all.*" The document specifically states that "*this will be achieved through: ensuring well conserved and managed land; zero per cent deforestation; availability of adequate and clean water resources; restored and well conserved biodiversity and ecosystems; low population growth; preventing air and noise pollution from becoming serious problems; contributing to global efforts to managing climate change and other global environmental issues; incorporating environmental considerations at all stages, and enhancing the participation of the public in the planning and implementation of natural resource and environmental programmes.*"
- The new Malawi Growth and Development Strategy II (MDGS 2011 - 2016), launched in April 2012, is the second medium term national development strategy. It represents a decisive and strategic single reference document to be followed by all stakeholders to achieve the goal of wealth creation through sustainable economic growth and infrastructure development. The fundamentals of the MGDS II are based on the shared Vision 2020 and therefore it guides the national development process by building on the gains, lessons and best practices achieved during the implementation of the predecessor strategy. The MGDS II is built around six broad thematic areas namely: Sustainable Economic Growth; Social Development; Social Support and Disaster Risk Management; Infrastructure Development; Improved Governance; and Cross Cutting Issues. From these themes, the MGDS II identifies nine Key Priority Areas which are central to the achievement of sustainable

economic growth and wealth creation. The last of these key priorities is *Climate Change, Natural Resources and Environmental Management*.

- Malawi adopted a National Energy Policy in 2003 which promotes diversification of energy sources and supply. The policy was followed up with National Energy Acts for electrification, rural electrification and governance. The Power Sector Reform Strategy (PSRS) approved in 2003 allows private sector participation and competition as a driver of the overall National Energy Policy and established the Malawi Energy Regulatory Authority (MERA). MERA is now mandated to oversee the development of system expansion studies and issue tenders for new generation to meet the country's demand. The Authority is also mandated to review and set tariffs for all players in the energy sector. The Malawi Energy Policy is now due for update and revision. Although there is broad coverage of renewable energy and energy efficiency in the current policy, there are no specific strategies to initiate action plans in those areas. The revision and updating of the Policy and its related Acts will be supported by the new the UNDP Project - *Sustainable Energy Management Support to Malawi* (see Section B.3), which is the overarching energy support programme under which this present GEF Project falls, and which will also fund the development of a National Renewable Energy Strategy. As evidence of their commitment to a diversified energy mix, the Department of Energy has recently tabled a Feed-in-Tariff policy which would be applicable to companies, organizations or individuals who generate electricity from renewable sources and wish to feed it to the national grid.
- The country does not yet have in place a Climate Change Policy, however work began in early 2012 (under the UNDP-funded National Climate Change Policy) to formulate an integrated climate change policy that recognizes the multiple dimensions and cross-cutting nature of CC. This policy aims to harmonize policies and programs, while bridging gaps between sectoral policies. It will include specific references to mitigation actions including promotion of renewable energy.
- The Second National Communication to the UNFCCC states that "it is incumbent upon public and private sector organizations, including rural communities, to implement renewable energy technologies to reduce GHGs emissions arising from the Energy Sector." Among the mitigation options prioritized in the SNC are the following activities, all of which will be enabled by the expansion of mini-grids: (i) cooking using grid electricity; (ii) increasing efficiency in ESCOM's capacity and energy balances; and (iii) more efficient use of lighting technologies.³¹
- The Malawi State of Environment and Outlook Report (SEOR) – (MNREE, 2010) recommends a series of priority mitigation measures such as "development of a unified climate change policy to reduce Malawi's emissions; urgently seeking alternative energy sources that can reduce the population's dependence on firewood and charcoal; and creating subsidies or incentives for poor consumers to shift to green energy."
- The Local Government Act (1998) and the National Decentralization Policy (1998) do not include specific mention of climate change considerations but their revisions would provide an opportunity for mainstream climate change and energy considerations into local planning and decision making. In Malawi, local governance and development processes are coordinated by the district councils; as such the mainstreaming of mandatory climate change and low-carbon considerations into their policies, programs and plans would contribute to further promotion of renewable energy technologies (such activities are also prioritized under the UNDP *Sustainable Energy Management Support to Malawi* Programme).
- National Adaptation Plan (NAP): As supported by the NCCP, the government will embark soon (2013) on developing the first National Adaptation Plan, that will supersede the National Adaptation Plan of Action that was launched in 2008. The government is also set to embark on development of Nationally Appropriate Mitigation Actions (NAMAs), supported under the NCCP, with focus on the Agriculture, Transport and Energy sectors. An initial draft NAMA on agriculture is already posted on the UNFCCC website. Any future NAMA on Energy will be developed in conjunction with this project.

³¹ See footnote #14

B.2. GEF focal area and/or fund(s) strategies, eligibility criteria and priorities:

Within the GEF V Focal Area of climate change (CC) mitigation, the proposed project supports Strategic Objective 3: “Promoting investment in renewable energy technologies”.

B.3 The GEF Agency’s comparative advantage for implementing this project:

At a global level, this project fits under the UNDP-GEF EITT (Energy, Infrastructure, Technology and Transport) Signature program number 1 “SP1 – Clean Energy” Promoting access to clean and affordable energy systems and services. It is one of a host of GEF V projects developed by UNDP that focus on support for small, mini- and micro-hydro development (both on-grid and off-grid). Other related projects in the region focused on hydropower include GEF V PIFs developed for Sao Tome and Principe, Congo-Brazzaville, Equatorial Guinea and Democratic Republic of Congo. UNDP EITT staff have extensive past experience with promoting innovative small/mini/micro hydropower development; as an example UNDP’s MDG Carbon Facility and EITT Africa team recently registered a small hydro CDM program of activities (POA) in Kenya developed by the Kenya Tea Development Agency, one of the first of its kind in Africa.

The project emanates from the priorities and proposed action plan in the Malawi SE4ALL Gap Analysis & Rapid Assessment, a process which UNDP has co-funded and/or supported in 26 countries. More specifically, the proposed project is supportive of a broader set of activities that UNDP has been involved with as regards assisting African countries incorporate decentralized energy solutions into their SE4A Action Plans. To that end, at the SE4ALL Global Facilitation Meeting in Tunis in 2012, the CEO of the SE4A Global Facilitation Team, Kandeh Yumkella, requested UNDP to develop the global strategy for decentralized/bottom-up energy solutions.

Subsequent to that request various African institutions agreed that this approach should be incorporated into the Africa SE4ALL framework and highlighted the importance of striking a reasonable balance between centralized and decentralized energy solutions in realizing the overall SE4ALL objectives, including organized structures at the grassroots to reach under-served populations. Based on a request by the Conference of Energy Ministers of Africa (CEMA) in November 2012, UNDP – with the collaboration of AUC, NPCA and AfDB – developed an Africa Strategy for Decentralized Energy Services, which according to AU procedures, will now be tabled for adoption by Heads of State and Government at the AU Summit of January 2014. The UNDP Regional Energy Project has now contracted Practical Action to support the development of decentralized energy program frameworks (embedded into the SE4A country action plan) in four countries – Ghana, Malawi, Kenya and Chad.

UNDP Malawi has put in place a system in the new UNDAF (2012-2016) to streamline the development of new projects and programs for the country. This entails that all donor projects are merged into more substantive programs covering climate change, environment and natural resources, PS development, sustainable energy and disaster risk management. Programme Support Documents (PSDs) have been developed for each of these areas and the objective is that all new projects are fully merged within these PSDs. In the environment cluster there are four substantive Programme Support projects, namely: i) Programme Support to Climate Change (PSD CC); ii) Programme Support to Environment and Natural Resources (PSD ENR); and iii) Programme Support to Disaster Risk Reduction (PS DRM), and iv) Programme Support to Sustainable Energy aim to streamline development projects in the country.

This project is embedded in the new UNDP Malawi Project Support Document: **Sustainable Energy Management Support to Malawi**. The Project Support Document (PSD) provides the framework for UNDP’s assistance to the Government of Malawi for a sustainable energy management support project for 2012 - 2016, following the Malawi Growth and Development Strategy II (MGDS-II) and United Nations Development Assistance Framework (UNDAF 2012 – 2016) priorities. Under the UNDAF for 2012 – 2016, UNDP aims to support, through the Department of Energy (DoE) the following: *Output 1.3.4: Innovative renewable and energy saving technologies piloted in targeted locations in rural and peri-urban areas, enabling the development of a national programme.*

The Sustainable Energy Management Programme – funded with a core contribution of US\$1.9 million from UNDP Malawi which will be leveraged for this project as co-finance – has four main project outputs:

1. Sustainable Energy Management mainstreamed in policies and development plans at national and district level;
2. Data and knowledge on the advantages and possibilities attached to use of renewable energy technologies and energy efficient behaviour and technologies are made accessible to decision makers at house-hold, district and national level;
3. Coordination mechanisms and implementation arrangements for Renewable Energy and Energy Efficiency established and used at national level and in the 14 selected disaster-prone districts; and
4. Effective Project Management and Advisory Services ensured

Finally the project will also benefit from synergies with the UNDP Malawi Project Support Document: **Private Sector Development (PSD)** which supports UNDAF (2012 – 2016) Output 1.2.2: *Business services including financial innovation, access to markets (both national and international), business to business linkages supporting small and medium sized enterprises including farmer organizations, established in strategic industries.* The second outcome of the PSD project is to: *“Align business incentives better to increase the incentive for businesses to innovate technology/services and business models that connect the poor to markets more efficiently in manufacturing, agriculture and other strategic industries.”* The PSD operational approach is characterized by the use of two instruments: UNDP’s Inclusive Markets Development (IMD) and the Challenge Fund. The IMD will allow value chains work better for the poor, and the Challenge Fund will ensure that the objectives of the private sector are in line with the development objectives of Government of Malawi. Energy is being considered as one of the priority value chains for PSD support and therefore a pro-rated portion (\$500K) of the current PSD budget (3,131,923 USD from UNDP core funds) is allocated as co-finance for this project. The specific linkages between the PSD project and its instruments and this project’s activities and support will be done at PPG phase.


PART III: APPROVAL/ENDORSEMENT BY GEF OPERATIONAL FOCAL POINT(S) AND GEF AGENCY(IES)

A. RECORD OF ENDORSEMENT OF GEF OPERATIONAL FOCAL POINT (S) ON BEHALF OF THE GOVERNMENT(S):

(Please attach the [Operational Focal Point endorsement letter\(s\)](#) with this template. For SGP, use this [OFP endorsement letter](#)).

NAME	POSITION	MINISTRY	DATE (MM/dd/yyyy)
Mr. Dr. Aloysius M. Kamperewera	Deputy Director Environment Affairs Department and Convention Focal Point for UNFCCC	ENVIRONMENTAL AFFAIRS DEPARTMENT	April 18 th , 2013

B. GEF AGENCY(IES) CERTIFICATION

This request has been prepared in accordance with GEF/LDCF/SCCF/NPIF policies and procedures and meets the GEF/LDCF/SCCF/NPIF criteria for project identification and preparation.					
Agency Coordinator, Agency name	Signature	DATE (MM/dd/yyyy)	Project Contact Person	Telephone	Email Address
Adriana Dinu UNDP/GEF OIC and Deputy Executive Coordinator		9/9/2013	Lucas Black UNDP Regional Technical Advisor, EITT	Tel: +27 71 874 4893	lucas.black@undp.org

Annex I – Information on Selected MHPP Sites from the JICA RE Master Plan (2002)

